

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. C. S. Freeman, Superintendent U. S. Naval Observatory]
[Data furnished by Naval Observatory, in cooperation with Harvard, Yerkes, and Mount Wilson observatories]

[The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column]

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longi- tude	Lat- tude	Spot	Group	
1928							
May 1 (Naval Observa- tory).	h. m. 12 15	° -82.0 -73.5 -64.0 -57.5 -29.5 -29.0 -28.5 -19.0 -2.0 +7.5 +18.5 +28.5 +81.5	° 183.4 191.9 201.4 207.9 235.9 236.4 236.9 246.4 263.4 272.9 283.9 293.9 346.9	° -13.0 -19.0 -11.5 -12.0 -21.5 +9.5 +22.5 +10.0 -20.0 -14.0 -13.5 -19.0 -12.0	 15 25 201 123	 15 31	 <

POSITION AND AREA OF SUN SPOTS—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longi- tude	Lat- itude	Spot	Group	
1928—Continued							
May 9 (Naval Observa- tory).	h. m. 13 44	° -46.5 -41.0 -17.0 -9.5 +14.5 +21.5 +29.5 +42.0 +50.5 +69.0 +80.0	° 112.3 117.8 141.8 149.3 173.3 180.3 188.3 200.8 209.3 227.8 238.8	° +9.0 +5.0 +23.0 -11.5 -17.0 -12.5 -11.0 -14.0 -11.5 -21.0 +9.0	46 15 278 62	 31 62 494 170 216 15 154 62	 1,543
May 10 (Naval Observa- tory).	11 53	-34.0 -28.5 -2.5 -0.5 +3.5 +31.0 +42.0 +54.5	112.6 118.1 144.1 146.1 150.1 177.6 188.6 201.1	+9.0 +5.0 +23.0 -8.5 -12.0 -16.0 -11.0 -14.0	46 15 309 278	 22 31 62 679 1,442	
May 11 (Naval Observa- tory).	11 28	-21.0 +18.5 +42.0 +57.5 +66.0 +71.0	112.6 152.1 175.6 191.1 199.6 204.6	+9.0 -12.0 -17.0 -11.0 -15.0 -13.5	22 216 31	 19 309 247 844	
May 12 (Naval Observa- tory).	11 41	-8.0 +32.0 +51.0 +60.0 +69.5 +78.5	112.3 152.3 171.3 180.3 189.8 198.8	+9.0 -11.5 -17.5 -13.0 -11.0 -15.0	15 278	46 216 154 247 278 956	
May 13 (Naval Observa- tory).	11 48	-80.0 +46.0 +63.5 +72.5 +85.0	27.0 153.0 170.5 179.5 192.0	-12.0 -12.0 -17.5 -13.0 -11.0	 309	154 123 154 93 833	
May 14 (Naval Observa- tory).	11 45	-67.0 +59.5	26.8 153.3	-12.0 -12.0	 108 93	 201	
May 15 (Naval Observa- tory).	11 45	-81.0 -52.5	359.6 28.1	-12.5 -12.5	15 93	108	
May 16 (Naval Observa- tory).	11 43	-65.5 -42.5 -38.5	1.9 24.9 28.9	-11.5 -13.5 -11.0	9 15 31	 55	
May 17 (Harvard) -----	13 56	-23.0	30.0	-12.5	 17	17	
May 18 (Naval Observa- tory).	11 48	-12.0	28.9	-11.0	 6	6	
May 19 (Naval Observa- tory).	11 29	-41.0 -27.5	346.8 0.3	-10.0 -14.0	 6	15 21	
May 20 (Naval Observa- tory).	11 33	-40.0	334.5	-20.5	6	6	
May 21 (Naval Observa- tory).	11 53	-78.0 -70.0 -67.0	283.1 291.1 294.1	-15.5 -19.5 -20.0	108 46 25	 179	
May 22 (Naval Observa- tory).	12 48	-68.0 -63.5 -58.0 -51.5	279.4 283.9 289.4 295.9	+12.5 -16.0 -20.0 -20.0	 93 19 25	93 230	
May 23 (Naval Observa- tory).	12 42	-83.0 -54.0 -50.0 -44.5 -38.0	251.2 280.2 284.2 289.7 296.2	+9.0 +12.5 -16.5 -19.0 -20.0	154 77 6	 46 31 314	
May 24 (Naval Observa- tory).	13 11	-67.5 -40.0 -37.5 -32.0 -25.5	253.2 280.7 283.2 288.7 295.2	+9.0 +12.5 -17.0 -18.0 -20.5	154 77 62 15	 77 62 15 985	
May 25 (Harvard) -----	9 2	-57.5 -29.5 -26.0	252.5 280.5 284.0	+8.0 +13.0 -16.5	450 140	 71 661	
May 26 (Naval Observa- tory).	11 49	-70.0 -42.5 -11.0 -5.0	225.0 252.5 284.0 290.0	-10.0 +9.0 -17.0 -18.5	 62 62 31	123 278	
May 27 (Harvard) -----	11 14	-79.5 -55.0 -28.0 +0.5 +4.5	202.5 227.0 254.0 282.5 286.5	-7.0 -6.5 +10.0 +13.0 -18.0	519 134 69 62 239	 239	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longi- tude	Lati- tude	Spot	Group	
1928—Continued							
May 28 (Naval Observa- tory).	11 36	-76.5	192.2	+9.0	-----	216	-----
		-69.0	199.7	-12.5	-----	617	-----
		-50.5	218.2	-11.0	-----	93	-----
		-41.5	227.3	-10.0	-----	62	-----
		-16.5	252.2	+9.0	46	-----	-----
		+12.5	281.2	+12.5	-----	185	-----
		+15.0	283.7	-17.0	77	-----	-----
		+21.0	289.7	-18.5	-----	123	1,419
May 29 (Naval Observa- tory).	12 13	-74.0	181.1	-15.5	-----	139	-----
		-68.0	187.1	+9.0	-----	77	-----
		-61.0	194.1	+9.0	185	-----	-----
		-56.0	199.1	-12.5	-----	741	-----
		-44.5	210.6	+10.0	-----	62	-----
		-38.0	217.1	-10.5	-----	46	-----
		-28.0	227.1	-10.0	-----	62	-----
		-2.5	252.6	+9.0	31	-----	-----
		+26.5	281.6	+12.0	-----	185	-----
		+29.0	284.1	-17.0	62	-----	-----
+34.5	289.6	-19.0	-----	185	1,775		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longi- tude	Lati- tude	Spot	Group	
1928—Continued							
May 30 (Naval Observa- tory).	11 48	-60.5	181.6	-15.5	154		
		-54.0	188.1	+8.0		46	
		-48.0	194.1	+9.0	139		
		-43.5	198.6	-12.5		648	
		-30.0	212.1	+10.0		123	
		-24.0	218.1	-10.0		46	
		-15.5	226.6	-10.5		77	
		+10.0	252.1	+9.0	25		
		+37.5	279.6	+12.0		93	
		+41.0	283.1	-17.0	62		
		+43.5	285.6	+13.5		62	
		+47.5	289.6	-19.0		108	1,583
May 31 (Naval Observa- tory).	11 46	-47.0	181.9	-16.0	123		
		-40.0	188.9	+8.5		40	
		-34.5	194.4	+9.0	154		
		-29.5	199.4	-13.0		586	
		-20.0	208.9	+10.5	62		
		-14.5	214.4	+8.5		46	
		-9.0	219.9	-10.5		31	
		-1.0	227.9	-10.5		93	
		+23.0	251.9	+9.0	31		
		+50.0	278.9	+12.0		77	
		+55.0	283.9	-17.0	62		
		+58.0	286.9	+13.0		93	
		+63.0	291.9	-19.0	93		1,491
Mean daily area for May.							912

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

As indicated in Table 1 the average free-air temperatures for May were close to normal with the exception of Ellendale where moderately large positive departures occurred at all levels. Relative humidity departures were mostly negative, those at Ellendale being of considerable magnitude. Notwithstanding the supernormal temperatures at this station the vapor pressures averaged appreciably below normal. This is of significance in connection with the pronounced lack of precipitation during the month at Ellendale, the total being only 0.67 inch as compared to a normal of 2.80 inches.

Marked deficiencies in the free-air vapor pressures at Groesbeck likewise are of interest in connection with the dryness of the month, 63 per cent of the total rainfall at this station having fallen during one hour on the 20th. It will also be noted that, at this station, the free-air relative humidity averaged below normal as did the temperature, a relationship which might be expected to result in less than normal precipitation.

Of special interest in Table 2 are the northerly components which occurred in the resultant winds for the month at Ellendale as compared to the normal southerly component notwithstanding the fact that the temperature departures at this station were positive. At the other stations the resultant winds for the month as compared with their normals were in general agreement with the temperature departures, i. e., an excess of southerly components occurred with positive temperature departures and vice versa.

Easterly winds at high elevations in the middle latitudes indicate abnormal conditions and it is interesting therefore to note such a wind movement over the interior of the country between May 20 and 24. During this period a high pressure area settled down over the Great Plains States, its center moving slowly southward with practically no eastward component. With this relatively cold air over the Southern Plains States and western Gulf region winds over the Mississippi and Ohio Valleys were northerly in the lower levels and veered with altitude to northeasterly at 5,000 meters and higher.

At Knoxville on the 22d the wind was due east from 1,000 to 4,500 meters and southeast to 8,000 meters. During this period a low pressure area formed over the Gulf States and with the lack of eastward movement in the general circulation this storm developed to considerable intensity and produced widespread precipitation over this region.

Special pilot balloon observations from a number of stations were dispatched to Pittsburgh in connection with the elimination balloon race of May 30. A severe thunderstorm enveloped most of the balloons shortly after the take-off and only 3 out of 14 escaped the storm and made safe landings in Virginia. Lightning struck three balloons causing the death of two men and the injury of several others. Exceptionally strong vertical currents were encountered by the balloons in this storm. A study of these conditions will be published at a later time.

TABLE 1.—Free-air temperatures, relative humidities and vapor pressures during May, 1928

TEMPERATURE (° C.)

Altitude M. S. L. (meters)	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Cen- ter, Ind. (225 meters)		Washing- ton, D. C. ¹ (7 meters)	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Surface	20.0	+0.2	19.9	-0.5	15.0	+1.7	22.3	-0.4	16.3	-0.1	19.6	+1.6
250	19.9	+0.2	19.6	-0.5	-----	-----	21.3	-0.4	15.9	-0.2	16.8	+0.6
500	18.4	+0.5	17.6	-0.3	14.6	+1.7	19.5	-0.4	13.7	0.0	14.5	-0.4
750	17.0	+0.1	16.2	+0.1	13.4	+2.2	18.2	-0.3	12.3	+0.3	12.7	-0.7
1,000	16.1	+0.4	14.7	+0.1	11.8	+2.1	17.1	-0.3	10.8	+0.3	11.2	-0.7
1,250	15.4	+0.8	13.1	+0.1	10.1	+1.8	15.9	-0.5	9.5	+0.3	9.7	-0.8
1,500	14.3	+0.8	11.6	+0.1	8.5	+1.7	15.1	-0.4	8.0	+0.3	8.1	-1.0
2,000	11.6	+0.8	8.7	0.0	5.0	+1.2	12.7	-0.5	5.1	+0.3	5.4	-1.1
2,500	8.4	+0.4	6.0	0.0	2.1	+1.3	10.0	-0.6	2.7	+0.3	2.8	-1.1
3,000	5.1	-0.2	3.1	+0.1	-0.6	+1.4	6.7	-1.0	0.3	+0.1	0.4	-0.8
3,500	1.6	-0.1	0.1	+0.2	-3.2	+1.6	3.3	-1.8	-2.7	+0.1	-3.6	-1.4
4,000	-0.2	+1.1	-2.9	+0.3	-5.7	+2.2	-0.3	-1.7	-5.9	-0.1	-----	-----
4,500	-3.6	+0.7	-6.8	-0.1	-----	-----	-3.1	-1.8	-8.5	0.0	-----	-----
5,000	-5.8	+0.8	-10.3	-0.2	-----	-----	-5.9	-1.9	-----	-----	-----	-----

¹ Naval Air Station.